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PhD Dissertation Announcement

The Computational Principles and Mechanisms of Non-retinotopic Form Perception in Human Vision

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The perception of form is one of the most basic functions of the human visual system. Although there have been extensive studies on how humans analyze the form of static objects, the fundamental questions on the timing and dynamics of visual processing remain largely unknown. The broad long term goal of our research is to understand the mechanisms underlying dynamic form perception in the human visual system. In order to address this question, we use two stimulus paradigms: 1) Slit viewing (anorthoscopic perception) and 2) Ternus-Pikler display. By using slit viewing, we show that the solution to the problem of dynamic form perception requires interactions between form and motion systems in the human visual system. We further show that the complete solution also necessitates interactions between low-level retinotopic and high-level non-retinotopic mechanisms in the form system itself. Importantly, our results imply that these interactions are controlled by perceptual grouping operations. By using the Ternus-Pikler display, we further elucidate these interactions by pitting retinotopic and non-retinotopic relations against each other in order to study their individual contributions in the dynamic form perception. We show that features of moving objects can be perceived at locations where these features are not present. Furthermore, we show that this non-retinotopic feature attribution can be disrupted by a spatiotemporal discontinuity in the retinotopic space and/or in the lack of attention. Overall, our results suggest complex interactions between form and motion systems as well as between low- and high-level mechanisms in the form system. Our research also offers an important step towards building a theoretical framework wherein such interactions can be studied neurophysiologically.

Committee Chair:	Dr. Haluk Öğmen	Place: N328 (ECE Conference Room)
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